

$$1) \quad \frac{y}{2} = \frac{2x^2}{2} - \frac{4x}{2} - \frac{4}{2}$$

$$\frac{y}{2} = x^2 - 2x + \boxed{1} - 2 - \boxed{1}$$

$$2 \left( \frac{y}{2} = (x-1)^2 - 3 \right)$$

$$y = 2(x-1)^2 - 6$$

$$\boxed{\text{Vertex: } (1, -6)}$$

$$2) \quad \frac{y-2}{+2} = \frac{-\frac{1}{4}(x+5)^2}{+2}$$

$$y = -\frac{1}{4}(x+5)^2 + 2$$

$$\text{Turning Point: } \boxed{(-5, 2)}$$

$$3) \quad y = -3(x+4)^2 + 3$$

Vertex:  $(-4, 3)$

$$4) \quad x^2 + 10x - 4y + 9 = 0$$

$$x^2 + 10x + \boxed{25} + 9 - \boxed{25} = 4y$$

$$\frac{(x+5)^2}{4} - \frac{16}{4} = \frac{4y}{4}$$

$$\frac{1}{4}(x+5)^2 - 4 = y$$

positive  
↺

Vertex:  $(-5, -4)$

+ 1

P-value

$$\frac{1}{4} = \frac{1}{4p}$$

$$p = 1$$

$$(-5, -3) = \text{Focus}$$

b/c its  
positive  
Focus is  
above vertex

$$5) \quad x^2 - 12x - 12y + 24 = 0$$

$$x^2 - 12x + \boxed{36} + 24 - \boxed{36} = 12y$$

$$-\frac{12}{2} = -6$$

$$(-6)^2 = 36$$

$$(x-6)^2 - 12 = 12y \left(\frac{1}{12}\right)$$

$$\frac{1}{12}(x-6)^2 - 1 = y$$

$\frac{1}{12}$  is positive  
so directrix  
is below the  
vertex

$$\text{vertex} = (6, -1)$$

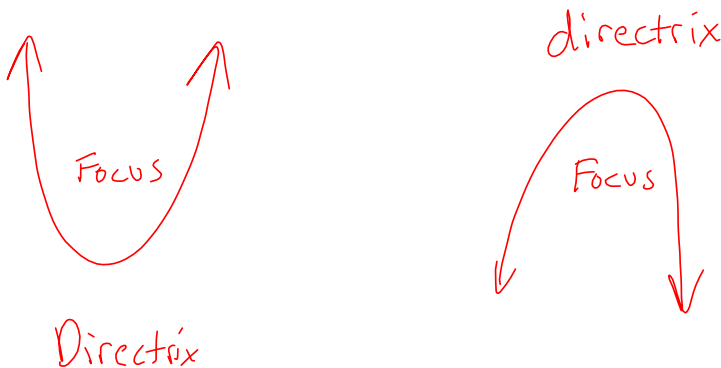
-3

$$\text{directrix: } \boxed{y = -4}$$

$$\frac{1}{12} = \frac{1}{4p}$$

$$12 = 4p$$

$$p = 3$$



positive

$$(x+5)^2 + 8 = 8y \quad \frac{1}{8}$$

P-value

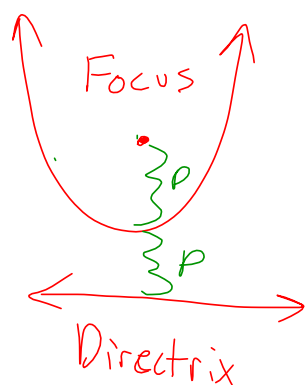
$$\frac{1}{8} = \frac{1}{4p}$$

$$\delta = 4p$$

$$2 = p$$

5

7) Distance between focus and directrix is double  $p$ -value



$$y = \frac{1}{12}x^2 + 4 \quad y = \frac{1}{4p}(x-h)^2 + k$$

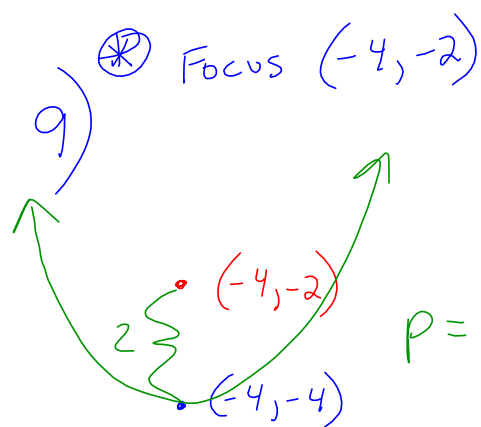
$$\frac{1}{12} = \frac{1}{4p}$$

$$12 = 4p$$

$$3 = p$$

$$3 \times 2 = \boxed{6}$$

8) All points equidistant from a focus point and directrix



$$p = 2 \quad y = \frac{1}{4(2)}(x - (-4))^2 + (-4)$$

$$y = \frac{1}{8}(x+4)^2 - 4$$

$$y = \frac{1}{12}(x-0)^2 + 4 = \frac{1}{12}x^2 + 4$$

$$y = \frac{1}{4p}(x-h)^2 + k$$

$$12 = 4p$$

$$p = 3$$

10) Focus:  $(1, -1)$   
directrix:  $y = 7$

Need:  
 vertex  
 p-value

Vertex: x-value is  
 same as focus  
 and y-value is  
 average of focus  
 and directrix y-values

$$\frac{-1 + 7}{2} = 3$$

$$\text{Vertex} = (1, 3)$$

P-value: Half the difference  
 between y-values  
 of focus and directrix:  
 $\frac{\text{Focus} - \text{Dir}}{2}$

$$\frac{-1 - 7}{2} = -4$$

Focus is below the directrix so p is (-)

Equation:

$$y = \frac{1}{4(-4)}(x-1)^2 + 3$$

OR

$$y = -\frac{1}{16}(x-1)^2 + 3$$

11) Vertex:  $(1, 3)$

Focus:  $(1, 5)$

Need:  
 ✓ vertex  
 ✓ p-value

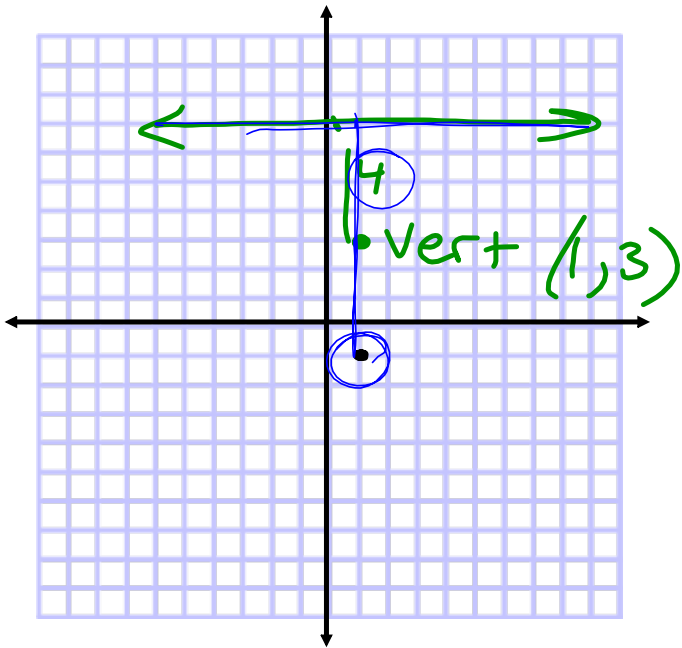
p-value is difference in  
 y-values of Focus and vertex.

$$p = 5 - 3 = 2$$

Equation:

$$y = \frac{1}{4(2)}(x-1)^2 + 3 \quad \text{OR} \quad y = \frac{1}{8}(x-1)^2 + 3$$





Vertex:  $\frac{0+(-6)}{2} = -3 \rightarrow (1, -3)$

P-value:  $\frac{0 - (-6)}{2} = 3$

Equation:  
 $y = \frac{1}{4/3}(x-1)^2 - 3$

Directrix:  $y = 3$

a) Vertex:  $\frac{1+3}{2} = 2 \rightarrow (-2, 2)$

b) P-value =  $\frac{1-3}{2} = -1$

Equation:

$$y = \frac{1}{4(-1)} (x - (-2))^2 + 2$$

OR

$$y = -\frac{1}{4} (x+2)^2 + 2$$

14) The y-axis

15) The origin (Turn upside down)

16) a)  $f(x) = \frac{5}{x} - \frac{3}{x}$

$f(-x) = \frac{5}{(-x)} - \frac{3}{(-x)}$

$= -\frac{5}{x} - (-\frac{3}{x})$

$= -\frac{5}{x} + \frac{3}{x}$  Not even

$= -(\frac{5}{x} - \frac{3}{x}) \leftarrow \text{ODD}$

b)  $f(x) = x^4 - x^2 - 6$   
 $f(-x) = (-x)^4 - (-x)^2 - 6$   
 $= x^4 - x^2 - 6 \leftarrow \text{Even}$

$$\begin{aligned} c) \quad f(x) &= \frac{x^3 - x}{x^3 + x} \\ f(x) &= \frac{(-x)^3 - (-x)}{(-x)^3 + (-x)} \\ &= \frac{-x^3 + x}{-x^3 - x} \\ &= \frac{\cancel{x}^3 (x^3 - x)}{\cancel{x}^3 (x^3 + x)} = \text{Even} \end{aligned}$$

$$17) \quad 1+2 \quad 1+2(2) \quad 1+2(3) \quad 1+2(4) \quad 1+2(5)$$

$$3, 5, 7, 9, 11$$

increase by 2 every "time"

$$\sum_{x=1}^5 1+2x$$

$$18) \quad \sum_{x=6}^{10} (3x-2)$$

$$(3(6)-2) + (3(7)-2) + (3(8)-2) + (3(9)-2) + (3(10)-2)$$

$$16 + 19 + 22 + 25 + 28$$

$$19) \quad \sum_{k=1}^8 3 \cdot 2^{k-1} =$$

$$(3 \cdot 2^{1-1}) + (3 \cdot 2^{2-1}) + (3 \cdot 2^{3-1}) + (3 \cdot 2^{4-1}) + (3 \cdot 2^{5-1}) + (3 \cdot 2^{6-1}) + (3 \cdot 2^{7-1}) + (3 \cdot 2^{8-1})$$

$$3 + 6 + 12 + 24 + 48 + 96 + 192 + 384$$

$$= 765$$

$$20) \quad \sum_{n=1}^7 (-2)^{n-1}$$

$$(-2)^{1-1} + (-2)^{2-1} + (-2)^{3-1} + (-2)^{4-1} + (-2)^{5-1} + (-2)^{6-1} + (-2)^{7-1}$$

$$(-2)^0 + (-2)^1 + (-2)^2 + (-2)^3 + (-2)^4 + (-2)^5 + (-2)^6$$

$$1 - 2 + 4 - 8 + 16 - 32 + 64$$

expanded form

$$= 43 \text{ sum}$$

